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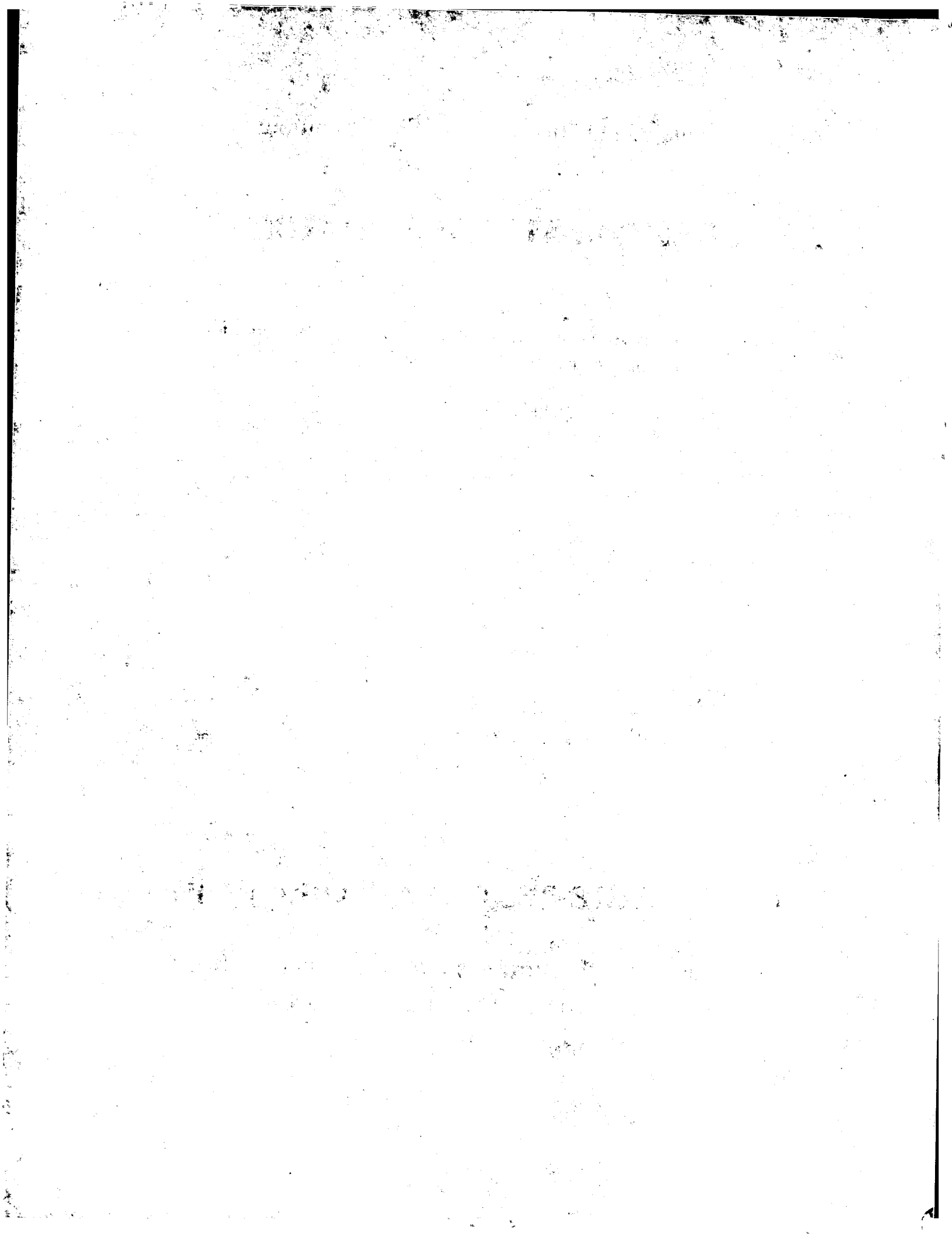
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## PATENT SPECIFICATION



Inventor: JOSEPH HOPKINS

730,338

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## COMPLETE SPECIFICATION

## Improvements in and relating to Tube Expanders

We, DANIEL ADAMSON & COMPANY LIMITED, a British Company, of The Engineering Works, Dukinfield, in the County of Chester, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention has reference to tube expanders and has for its object to provide a tube expander which will be easier to operate than tube expanders now used, and the withdrawal of the expander from the expanded tube is easier and quicker than is now possible.

A tube expander according to this invention comprises a rotatable and longitudinally slidable tapered mandrel in a cylindrical casing having a driving connection at one end and a roller cage at the other end, the mandrel being urged outwardly by a spring and urged inwardly by a weaker spring, the outward urge of the stronger spring being removable, whereby when the mandrel has been moved outwardly to expand a tube by urging rollers in the cage outwardly and the direction of rotation of the roller cage is reversed, the weaker spring now free to expand will withdraw the mandrel.

The invention is more particularly set forth with reference to the accompanying drawings in which:—

Fig. 1 is an elevation of a tube expander according to the invention;

Fig. 2 is a longitudinal section; and

Fig. 3 is a cross section on the line III—III of Fig. 1.

As shown in the drawings a tube expander is in the form of a cylindrical casing 4 which at one end 5 is adapted for connection to a driving unit (not shown in the drawings) such as a pistol grip by which the whole tube expander can be held and operated. Inside the cylindrical casing 4 and abutting on the inside end of the connection 5 to the driving unit is a helical spring 6 bearing at its other end on a thrust disc 7 with an annular groove 8. The annular groove 8 is engaged by radial pins 9 on a sleeve 10 outside the circular

casing 4, the pins 9 being in slots 11 in the circular casing, the slots 11 having angular or locking ends so that when the sleeve is slid back and given a turn it will compress the spring 6. When the spring is not compressed, the position being shown in Fig. 2, it pushes the thrust disc 7 forward against a head 12 on the inside end of a tapered mandrel 13 and when compressed this pressure is removed.

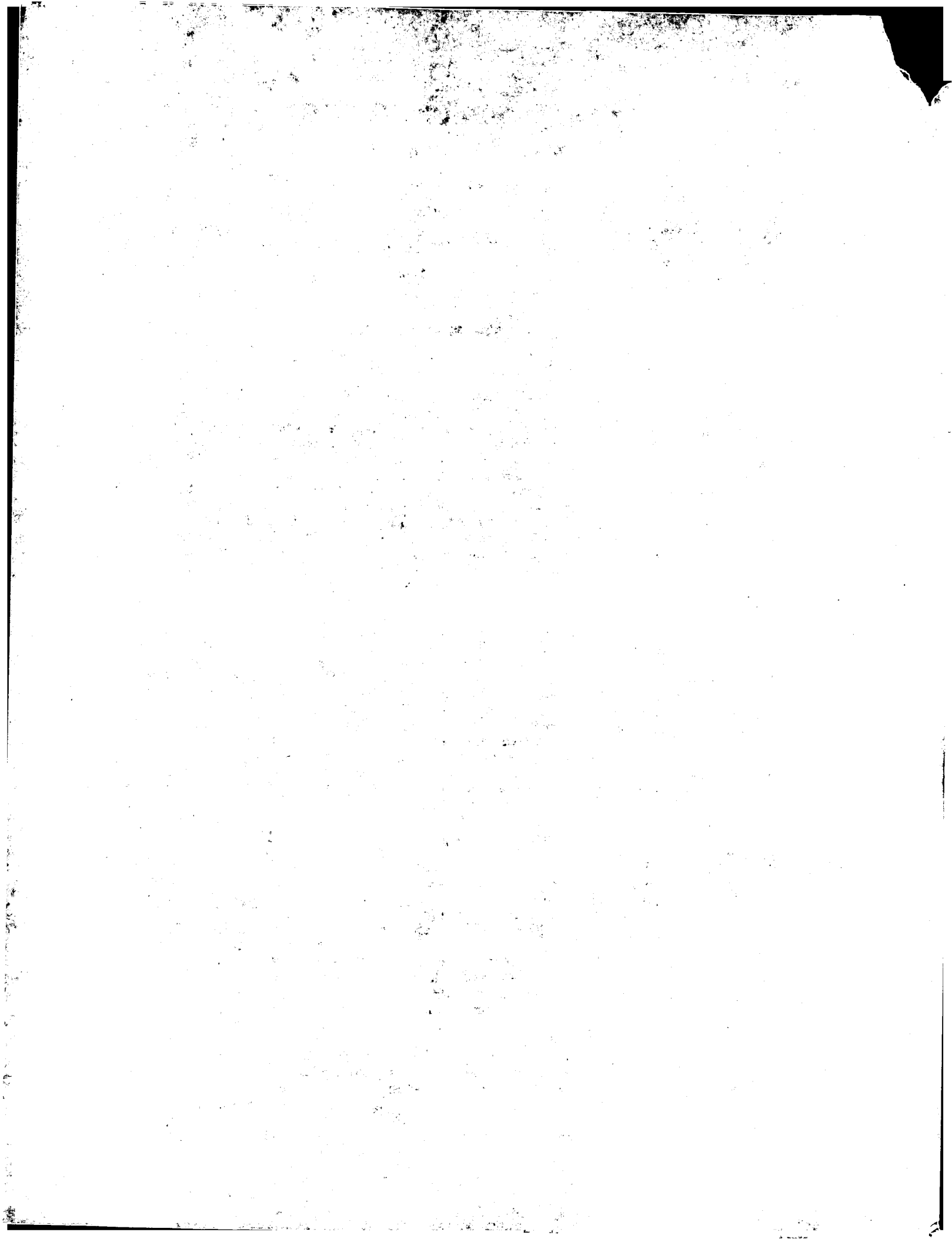
The tapered mandrel 13 has around it a helical spring 14 weaker than the spring 6 engaging the thrust disc 7 and this spring 14 i.e. the weaker spring, abuts against a thrust plate 17 at the forward face of the mandrel head 12 and the inside end 15 of a roller cage 16 secured in the end of the circular casing 4 remote from the connection to the driving unit; this spring 14 tends to push the mandrel inward by pushing against the thrust plate 17, while the stronger spring 6 when free to do so tends to push it out.

The roller cage 16 has mounted in it tapered rollers 18 which lie on the tapered mandrel 13 and are thus pressed outwardly by the mandrel when it is moved forward and can move inwardly when the mandrel is withdrawn.

When the tube expander is to be used, the end of roller cage 16 is put into a tube 19, a loose spacer collar being used between the plate in which the tube is mounted and the tube expander, the back and more powerful spring 6 being freed to urge the mandrel forward by releasing the pins 9 from their locking position at the top of the slots 11.

The driving means is now set in operation and the whole of the apparatus is rotated and the tapered rollers rotate on their own axes by engagement with the tube 19 and rotate with and help to draw forward the mandrel 13. When the operation is completed by the mandrel having forced out the rollers 18, the drive is automatically stopped by an overload release which may be mechanical or electrical.

When this takes place, the sleeve 10 on the cylindrical casing 4 is pushed back and turned to lock the pins 9, and this removes the pressure of the back and stronger spring 6



from the mandrel 13 so that the weaker spring 14 now urges the mandrel inwards by pressing on the thrust plate 17, but the mandrel is unlikely to move inwards as it is gripped in its outward position by the rollers 18 which are themselves gripped by the expanded tube 19. The drive is, however, now started in the reverse direction and this rotation, together with the pull of the spring 14 at once releases the mandrel so that the tube expander can easily be withdrawn.

It is common with existing tube expanders to reverse the direction of rotation to withdraw the tube expander but this now takes a long time as there is nothing to assist the withdrawal and the whole apparatus has to be slowly worked out as it is rotated.

What we claim is:—

1. A tube expander having a rotatable and longitudinally slidable tapered mandrel in a cylindrical casing with a driving connection at one end and a roller cage at the other, the mandrel being urged outwardly by a spring and urged inwardly by a weaker spring, the outward urge of the stronger spring being removable whereby when the mandrel has been moved outwardly to expand a tube by urging the rollers in the cage outwardly, and the direction of rotation of the roller cage is reversed the weaker spring now free to expand will withdraw the mandrel.

2. A tube expander according to the preceding Claim comprising a cylindrical casing having external means for connecting it to a driving mechanism, and within it a mandrel

tapered at one end, the mandrel being surrounded by two springs, one stronger than the other, pressing on a slidable head resting on the head of the mandrel against the other side of which mandrel head the weaker spring presses in the reverse direction, the slidable head being movable from the head of the mandrel by a sleeve on the outside of the cylindrical casing having radial pins passing through slots in the cylindrical casing into a groove in the slidable head, the slots having turns at one end to receive the pins to hold the spring back, the stronger spring, when the pins are turned out of the slots automatically exerting pressure through the slidable head on the mandrel to urge it outward against the lesser pressure of the spring beyond.

3. In a tube expander according to either of the preceding Claims, a spring surrounding the mandrel to urge it outward when the expander is used for expanding a tube by rotating the roller cage in one direction, and a second spring to urge the mandrel inward when the roller cage is rotated in the reverse direction to withdraw it from the expanded tube.

4. A tube expander constructed and adapted to be operated substantially as herein set forth and as shown in the accompanying drawings.

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## PROVISIONAL SPECIFICATION

### Improvements in and relating to Tube Expanders

We, DANIEL ADAMSON & COMPANY LIMITED, a British Company of The Engineering Works, Dukinfield, in the County of Chester do hereby declare this invention to be described in the following statement:—

This invention has reference to tube expanders and has for its object to provide a tube expander which will be easier to operate than tube expanders now used, and the withdrawal of the expander from the expanded tube is easier and quicker than is now possible.

A tube expander according to this invention comprises a rotatable and longitudinally slidable mandrel in a cylindrical casing having a driving connection at one end and a roller cage at the other end, the mandrel being urged outwardly by a spring and urged inwardly by a weaker spring, the outward urge of the stronger spring being removable, whereby when the mandrel has been moved outwardly to expand a tube by urging rollers in the cage outwardly and the direction of rotation of the mandrel is reversed, the weaker spring now free to expand will withdraw the mandrel.

In one construction of tube expander according to this invention, a cylindrical casing is used which at one end is adapted for connection to a driving unit such as a pistol grip by which the whole tube expander can be held and operated. Inside the cylindrical casing and butting on the inside end of the connection to the driving unit is a helical spring bearing at its other end on a thrust disc with an annular groove. The annular groove is engaged by radial pins on a sleeve outside the circular casing, the pins being in slots in the circular casing having angular or locking ends so that when the sleeve is slid back and given a turn it will compress the spring. When the spring is not compressed it pushes the thrust disc forward against a head on the inside end of a tapered mandrel and when compressed this pressure is removed.

The tapered mandrel has around it a helical spring weaker than the one engaging the thrust disc and this spring i.e. the weaker spring, abuts against the forward face of the mandrel head and the inside end of a roller cage



secured in the end of the circular casing remote from the connection to the driving unit; this spring tends to push the mandrel inward, while the stronger spring when free to do so tends to push it out.

5 The roller cage has mounted in it tapered rollers which lie on the tapered mandrel and are thus pressed outwardly by the mandrel when it is moved forward and can move inwardly when the mandrel is withdrawn.

10 When the tube expander is to be used, the end of the cage is put into the tube, a loose spacer collar being used between the plate in which the tube is mounted and the tube expander, the back and more powerful spring being freed to urge the mandrel forward by releasing the pins from the their locking position.

15 The driving means is now set in operation and the whole of the apparatus is rotated and the tapered rollers rotate on their own discs by engagement with the tube and rotate with and help to draw forward the mandrel. When the operation is completed, the drive is automatically stopped by an overload release which may be mechanical or electrical.

When this takes place, the sleeve on the cylindrical casing is pushed back and turned to lock the pins, and this removes the pressure of the back and stronger spring from the mandrel so that the weaker spring now urges the mandrel inwards, but the mandrel is unlikely to move inwards as it is gripped in its outward position by the rollers which are themselves gripped by the expanded tube. The drive is, however, now started in the reverse direction and this rotation together with the pull of the spring at once releases the mandrel so that the tube expander can easily be withdrawn.

It is common with existing tube expanders to reverse the direction of rotation to withdraw the tube expander but this now takes a long time as there is nothing to assist the withdrawal and the whole apparatus has to be slowly worked out as it is rotated.

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730,338 COMPLETE SPECIFICATION  
1 SHEET

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